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CASE REPORT

Food/farmed animals

Surgical correction of a double congenital hernia in a veal calf

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Abstract

This clinical case report describes the rare occurrence and successful surgical management of two simultaneous congenital hernias, umbilical and perineal, in a crossbred veal calf. At 5 days of age, the animal, weighing approximately 40 kg, showed visible swelling in the umbilical and perineal regions together with a congenital tail malformation. After careful clinical evaluation, the calf was sedated, and an umbilical herniorrhaphy using an autologous peritoneal flap was performed. For the perineal hernia, necrotic tissue was debrided, and the defect was repaired by suturing the pelvic diaphragm and closing the superficial layers with standard suture patterns. Postoperative care included multimodal analgesia, antibiotics and wound management. Follow-up examinations at 7 and 90 days confirmed complete functional recovery without complications. Histological and serological tests excluded infectious or neoplastic aetiologies, and it was not possible to identify a common cause for the two abnormalities. Nevertheless, the outcome supports surgical treatment as the first-choice option for resolving congenital hernias in cattle.

KEYWORDS

anaesthesia, analgesia, anatomy, calves, surgery

BACKGROUND

Umbilical hernia is the most frequently reported congenital malformation in calves, along with anal atresia.[1] The most widely accepted aetiology is delayed closure of the umbilical ring, allowing the abdominal viscera to protrude externally.[2,3]

In some cases, when the hernia is irreducible, it can become significantly enlarged, leading to complications such as incarceration or strangulation, which are life-threatening for the animal.[4] Another, less common type of hernia observed in various animal species, and rarely in cattle, is the perineal hernia. This condition is characterised by protrusion of abdominal or pelvic organs from their anatomical position into the subcutaneous perineal region due to rupture or weakening of the pelvic diaphragm, which supports the rectal wall.[5] Although the exact causes of this muscular weakness remain unknown, several predisposing factors have been proposed, including neurogenic and senile muscular atrophy, prostatic disease, chronic constipation, myopathies, hormonal imbalances and genetic predisposition.[5,6]

Documented cases of perineal hernia in cattle and buffalo are rare, with females appearing to be more predisposed.[7] These hernias are often diagnosed early in pregnancy or shortly after calving.[7] The most accepted hypotheses suggest a possible traumatic origin[6,8] or repeated episodes of chronic constipation.[9] In veterinary practice, different surgical techniques have been described to repair hernias, including simple direct closure of the defect, reinforcement with synthetic mesh, or the use of autologous tissues such as peritoneal flaps.[2,3,10] The choice of technique depends on the size and location of the defect, the condition of the surrounding tissues, and economic and management considerations in food-producing animals.

CASE PRESENTATION

The clinical case concerns a crossbred heifer from a dairy cattle farm in the province of Ragusa. At birth, the calf presented with two congenital hernias: an umbilical hernia and a perineal hernia. The animal underwent a clinical examination at 5 days of age, during which the owner reported that the calf had exhibited both abnormalities since birth. The calf weighed approximately 40 kg.

On physical examination, two main lesions were identified: a swelling at the umbilical orifice and an unusual skinless mass located in the perineal region, specifically to the right of the anal orifice.

Additionally, the calf had a congenital tail deformity, with deviation to the right.

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The detected abnormalities did not cause any systemic symptoms in the animal, which otherwise appeared healthy. The swelling at the umbilical site measured approximately 5 cm in diameter and was covered with intact skin. In contrast, the perineal mass measured about 5–6 cm, had an irregular appearance and consisted of protruding tissue, partially covered with necrotic tissue (Figure 1).

Palpation of the swelling at the umbilical level revealed a round-shaped, soft mass measuring approximately 4 × 5 cm with regular margins. It was neither warm nor painful to the touch and could be reduced manually, confirming the reducibility of the hernial content. Based on the collected data, the lesion was diagnosed as a reducible umbilical hernia.

The perineal lesion appeared as a protrusion of soft tissue, with superficial necrosis but no obvious communication with the rectum (Figure 2). Rectal examination was compatible with a defect of the pelvic diaphragm, and the lesion was interpreted as a congenital perineal hernia.

TREATMENT

Following the clinical examination and confirmation of the calf's optimal general health, surgical correction of both swellings was elected.

A catheter was placed in the jugular vein, and romifidine (dosage 0.08 mg/kg intramuscularly; Sedivet, Boehringer Ingelheim Animal Health) was administered for sedation. Pain management was provided by slowly administering tramadol (1 mg/kg intravenously; Altadol 5%, Formenti) using an infusion pump (Angel).[10–15] Ringer's lactate was administered intravenously (5 mL/kg/h).

The respiratory rate (RR) was determined by counting thoracic excursions per minute. Heart rate (HR), systolic, diastolic and mean arterial pressures (SAP, MAP, DAP), and oxygen saturation of haemoglobin (SpO_2) were monitored using a multiparameter anaesthesia monitor (EDAN Instruments Italy). A 20% increase in HR, RR or SAP was considered the threshold for administering intraoperative rescue analgesia, which consisted of 2% lidocaine (4 mg/kg; Esteve).[16–18] To enhance the effectiveness of the selected protocol, 15 mL of procaine hydrochloride (Procamidor, VetViva Richter) was injected along the incision planes for each lesion.[2]

After sedation, the animal was placed in dorsal recumbency, and the surgical field was prepared according to standard aseptic procedures.

The selected surgical technique for correcting the umbilical hernia was herniorrhaphy, following a method that involves the use of an autologous peritoneal flap as reinforcement for the suture.[2,11] A crescent-shaped skin incision was made over the swelling, followed by blunt dissection and removal of adhesions between the hernial sac and the subcutaneous tissue.

Once the hernial sac was isolated, it was incised to allow inspection of the contents and identification of the hernial ring. The herniated organs, consisting of a small portion of intestine and omentum, showed no signs of vascular or tissue compromise and were gently repositioned into the abdominal cavity through the hernial ring.

After debriding the sclerotic margins of the hernial ring, it was sutured using horizontal 'U' sutures with 2-metric absorbable polyglactin 910 (Vicryl 2). The hernial sac was then reshaped and used as an autologous peritoneal flap: it was folded over the reconstructed ring and sutured with simple interrupted sutures using the same suture material employed for herniorrhaphy[2,3,11] (Figure 3). This provided additional reinforcement to the abdominal wall.

Subsequently, the subcutaneous tissue was sutured using a continuous pattern with absorbable sutures, while the skin was closed with simple interrupted sutures using a non-absorbable monofilament material (e.g., nylon) to allow later removal.

Treatment of the perineal lesion involved removal of the superficial necrotic tissue and careful exploration of the hernial sac. The sac was opened to verify the absence of abdominal organs within the defect, and only peritoneal and soft tissue protrusion was observed. The remaining viable tissue was repositioned into the pelvic cavity through the defect in the pelvic diaphragm.

The edges of the defect were apposed, and the pelvic diaphragm was reconstructed using simple interrupted sutures of absorbable polyglactin 910 (Vicryl 2), taking wide bites of the surrounding healthy tissue to restore the continuity of the muscular and tendinous structures. Finally, the subcutaneous tissue and skin were closed in routine fashion in separate layers.

At the end of surgery, the calf was transferred to a quiet, clean area for close observation. It received systemic antibiotic therapy with amoxicillin (1 mL/10 kg once daily for 5 days; Betamox, 150 mg/mL, Vétoquinol), a broad-spectrum drug, by deep intramuscular injection. The wounds were treated immediately after surgery and then with an antibiotic spray (Terramicina Spray, Zoetis), applied twice a day for 5 days.[2]

Postoperative analgesia consisted of meloxicam (0.5 mg/kg intramuscularly once daily for 3 days) to ensure adequate pain control and animal welfare, in addition to the intraoperative analgesic protocol.

As a precaution, the most superficial tissue removed from the perineal mass was submitted for histological examination at the Istituto Zooprofilattico Sperimentale of Sicily, Palermo Area, to rule out the presence of possible neoplastic cells.

From the calf's mother, approximately 8 mL of blood was drawn from the coccygeal vein into an EDTA vacutainer and 8 mL into a vacutainer without anticoagulant. These samples were sent to the Istituto Zooprofilattico Sperimentale di Sicilia. The serum sample (without anticoagulant) was used to test for antibodies against Schmallenberg virus at the Exotic Disease Diagnostics Laboratory; the EDTA sample was used to test for bovine viral diarrhoea virus (BVDV) at the Laboratory of Viral Disease Diagnostics. Furthermore, the farm

LEARNING POINTS/TAKE-HOME MESSAGES

- Surgical treatment is the preferred treatment for congenital umbilical hernias in cattle.
- Vital signs monitoring is important for the proper management of pain, even during surgery on farm animals.
- Proper management of postoperative therapy is essential for the complete healing of the intervention site.

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FIGURE 1 Perianal hernia in the calf before surgery. Clinical presentation before surgical correction.



FIGURE 2 Perineal lesion with tissue necrosis.



FIGURE 3 Shaped hernia sac of umbilical hernia used as an autologous flap to support the traditional herniografy.

was officially free from brucellosis, tuberculosis and bovine leukosis.

OUTCOME AND FOLLOW-UP

The surgical procedure was successful, with complete reduction of both hernias and no postoperative complications. Two follow-ups were conducted: one 7 days after surgery and another 90 days post-surgery.

At the first follow-up, the wounds were dry, clean and free from infection, and the calf showed normal behaviour and appetite. At the second follow-up, complete healing of the surgical wounds was observed; the scars were no longer visible due to the uniform regrowth of the coat, and there was full functional recovery of the previously herniated organs, along with optimal overall condition of the calf (Figure 4).

The results of the blood tests aimed at detecting antibodies against Schmallenberg virus and bovine viral diarrhoea (BVD) were negative. The histological examination also yielded negative results for neoplasia, showing the presence of cystic dilatations partly lined with glandular epithelium with secretory activity, along with fibroblastic proliferation and a lymphogranulocytic infiltrate. The tissue analysed histologically was derived from superficial layers such as skin and subcutaneous tissue, which explains the presence of glandular tissue. The underlying part, however, represented a peritoneal protrusion.

DISCUSSION

Congenital malformations in cattle, known by the acronym BCM, occur sporadically, although various cases are reported in the literature. The presence of multiple congenital malformations in a single animal is often associated with a common pathogen responsible for the developmental defects.[19]

The clinical case in question is characterised by the simultaneous presence of three congenital anomalies: umbilical hernia, perineal hernia and tail deviation. The occurrence of these anomalies in the same subject led to the initial hypothesis of a possible maternal infection by a teratogenic pathogen. The viruses most frequently isolated in cases of congenital deformities in cattle are BVDV and Schmallenberg virus.[19,20]

The pathogenic mechanism of BVDV affects immature fetal neuronal cells and induces destruction of brain parenchyma, leading to cerebellar hypoplasia. In addition to the central nervous system, the virus can cause severe ocular lesions and alterations in the thymus, coat, lungs, bones and kidneys.[19,20]

Schmallenberg virus can also infect the fetus during pregnancy, causing teratogenic effects, particularly on the central nervous system, especially between the 60th and 180th day of gestation, leading to hydrocephalus and arthrogryposis. Deformities of the spinal column and arthrogryposis are secondary to central nervous system lesions, but are the most externally visible. The most common deformities are torticollis, often in combination with scoliosis and kyphosis of the spinal column.[19]

In the present case, however, the pathogenic effects described for both viruses do not fully match the clinical signs observed, and the diagnostic tests carried out on the dam were

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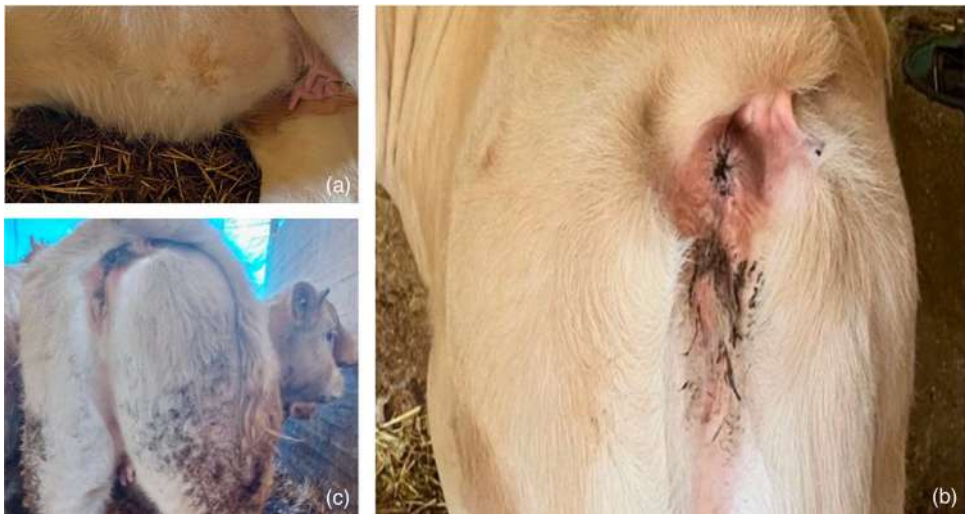


FIGURE 4 (a) Ventral portion of the abdomen in which it is possible to highlight the uniform regrowth of the hair around the umbilical scar; (b) perineal area, approximately 3 months after surgery; (c) perineal area, approximately 8 months after the surgery (February 2023), which shows the total absence of signs attributable to the surgery performed.

negative. This makes a viral aetiology unlikely as a common cause of the three malformations.

When analysing predisposing factors for the umbilical hernia, an umbilical infection was ruled out, as the calf showed no evidence of secondary umbilical infection, and a hereditary basis was considered less likely because the dam was a multiparous cow whose previous offspring did not have umbilical hernias. Information on the sire was unavailable, as it was no longer present on the farm at the time of investigation. The most plausible hypothesis in this case is a delay in closure of the umbilical ring, allowing abdominal viscera to herniate into the subcutaneous tissue.[2–4]

Perineal hernia is an uncommon condition in cattle compared to other domestic species. Congenital or acquired perineal hernias have been more frequently reported in dogs, particularly older males, where predisposing factors include benign prostatic hyperplasia and atrophy of the pelvic diaphragm.[21] Although similar mechanisms have been proposed in cattle,[5–8] they do not fully explain the occurrence of a perineal hernia in a young heifer. A congenital weakness or incomplete development of the pelvic diaphragm associated with neurogenic atrophy may be hypothesised in this calf.

Each malformation may therefore have its own aetiological cause: for the umbilical hernia, a delay in regression of the umbilical structures and failure of umbilical ring closure; for the tail malformation, an altered formation of the coccygeal vertebrae; and for the perineal lesion, a congenital deficit in the pelvic diaphragm, possibly linked to reduced innervation and muscle volume. The negative histological findings allow the neoplastic nature of the perineal lesion to be excluded. Moreover, the dam subsequently produced healthy calves without congenital lesions, and the calf in question was later fattened and sold without further clinical issues.

From a surgical perspective, several techniques have been described for the repair of abdominal wall and perineal hernias in large animals, including direct closure of the defect, reinforcement with synthetic mesh and the use of autologous tissue flaps.[2,3,5–8,11] In the present case, an autologous peritoneal flap was used to reinforce the umbilical herniorrhaphy. Compared with synthetic mesh, autologous tissue offers advantages in terms of biocompatibility, lower risk of foreign-body reaction or infection, and reduced costs, which are particularly relevant in food-producing species. The technique is also feasible under field conditions and does not require specialised materials.

Previous reports have described the use of autologous peritoneal flaps for umbilical hernia repair in pigs and in another calf with simultaneous hernias,[2,11] with good long-term outcomes. The present case supports these findings and confirms the usefulness of this technique for reinforcing large umbilical defects in calves.

Similarly, early surgical correction of perineal hernias, combined with appropriate intra- and postoperative analgesia, can result in favourable outcomes and restore normal function, as seen in this heifer.[5–8,21]

In conclusion, although the case remains unresolved in terms of identifying a single aetiological factor linking the three malformations, the successful outcome of the surgery confirms that surgical treatment is the most effective therapeutic approach for resolving congenital hernias in cattle.

AUTHOR CONTRIBUTIONS

Andrea Spadaro and Veronica Cristina Neve wrote the paper, Andrea Spadaro and Filippo Spadola acquired the data, Veronica Cristina Neve and Filippo Spadola conceived and designed the project, Giovanna Lucrezia Costa and Roberto Puleio analysed and interpreted the data, and Andrea Spadaro reviewed and edited the manuscript.

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adhered to. No ethical approval was required, as this is a case series with no original research data.

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